A Geochemical Study of the Shimabara Peninsula, Japan

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ABSTRACT

This study focuses on the geochemical characteristics of 22 samples from the Shimabara area, a peninsula on Kyushu Island, in the south of Japan. There are 8 hot springs samples with a temperature range of 30-37°C, 99.1°C and a pH of mostly neutral values of 6.6-7.5 with the exception of 2 samples which have very low pH values of 2.2 and 2.4. The elevation of sampling areas ranged from 10-240 m above sea level. An analysis was carried out partly at Kyoto-sangyo Company Inc. and the Kyoto University Campus Laboratories. The Japanese Standards reference (JIS K0101 *) was used for the cations including F, B and As whereas Kyoto-sangyo standard procedures were used for T-SiO2 and the isotopic analysis reported using standard notation relative to the NIST-SIAEA reference material V-SMOW with an analysis precision of ±0.1 ‰ and ±0.2 ‰, respectively. A quality check of the analysis results was done and a charge balance error determined (Freeze and Cherry 1979) with all values within ±5 ‰ error margin.

LOCATION MAP OF SHIMABARA PENINSULA AND SAMPLES

RESULTS

The sampling and analysis was carried out as per procedures by faculty and instructors from Analysis. Analysis was carried out partly at Kyoto-sangyo Company Inc. Japan laboratories and partly at the Kyoto University Campus Laboratories. The Japanese Standards reference (JIS K0101 *) was used for the cations including F, B and As whereas Kyoto-sangyo standard procedures were used for T-SiO2 and the isotopic analysis reported using standard notation relative to the NIST-SIAEA reference material V- SMOW with an analysis precision of ±0.1 ‰ and ±0.2 ‰, respectively. A quality check of the analysis results was done and a charge balance error determined (Freeze and Cherry 1979) with all values within ±5 ‰ error margin.

METHODS

The the Shimabara Peninsula is located in the Western part of Kyushu Island in Japan. The area is bordered by Tachibana Bay to the left and Mt. Unzen (Fugen-dake) dominates the island peninsula toward the southwest and Shimabara City is to the east side of the peninsula. It lies on the Beppu-Shimabara graben which extends from the north-eastern to the north-western section. There is a large number of spas and hot springs in this area. Previous investigations have been carried out by Fujimita et al. (2006) who identified four geothermal systems while Ohawa (2006) observed that the Obama system is a liquid-dominated, salt water geothermal system. Saibi (2010) concluded that the main water types are Na-Cl type with a significant water component in the Obama hot spring waters. This study collected 18 samples from the Obama hot springs area and 4 gas samples from two Mount Unzen fumaroles, Timbouda and Dakuoykun. Analysis was carried out at the Kyoto-sangyo Environmental Laboratories and at Kyoto University Laboratories. geothermal reservoir with temperatures ranging from 130-240 degrees using the Na-Ca geothermometers. The study also noted a drop in the concentrations of chlorides probably due to a drop in the amount of sea water circulation in the Obama area and possibly a dilution from fresh water recharge.

OBJECTIVES

The objectives of this study were to conduct a geochemical project of the area. The specifics are:

- Sampling of hot springs, spas and fumaroles.
- Analysis of the above samples both on site immediate analysis and comprehensively later in the laboratory.
- Interpretation of analyzed data.
- Making inferences and conclusions from the interpretations
- Developing a conceptual model for the area.

REFERENCES


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Figure 4: Concept Model of Shimabara Peninsula

Figure 1: Summary of T-SiO2 diagram for hot spring waters.

Figure 3: Plot of δD vs Cl for hot spring waters at Obama, Unzen and Shimabara.